Cisco Catalyst 3750 Metro Series Switches

The Cisco® Catalyst® 3750 Metro Series Switches are a new line of premier, customer-located switches that bring greater intelligence for Metro Ethernet access, enabling the delivery of more differentiated Metro Ethernet services.

Product Overview

With service provider-friendly hardware and mission-specific software, the Cisco Catalyst 3750 Metro Series is the first access switch optimized for both the Ethernet-to-the-home (ETTH) triple-play services and Ethernet-to-the-business (ETTB) VPN services. It provides the most complete security solution for Metro Ethernet access that covers subscriber, switch, and network protection. The Cisco Catalyst 3750 Metro Series supports multiple software images to provide a “pay-as-you-grow” deployment model. With service breadth spanning triple-play and Layer 2 and Layer 3 VPN services, reduced total cost of ownership (TCO) and operating expenses (OpEx) can be achieved from a single ETTH and ETTB access solution.

The switches feature bidirectional hierarchical quality of service (QoS) and traffic shaping, intelligent 802.1Q tunneling, VLAN translation, Multiprotocol Label Switching (MPLS), Ethernet over MPLS (EoMPLS), and Hierarchical Virtual Private LAN Service (H-VPLS) support and redundant AC or DC power. They are ideal for service providers seeking to deliver profitable business services, such as Layer 2, Layer 3, and MPLS VPNs, in several bandwidths and with different service-level agreements (SLAs). With flexible software options, the Cisco Catalyst 3750 Metro Series offers providers a cost-effective path for meeting current and future service requirements from enterprises and commercial businesses.

Configurations

The Cisco 3750 Metro Series (Figure 1) includes the following configurations:

Cisco Catalyst 3750 Metro Series with 24 10/100 ports plus two Small Form-Factor Pluggable (SFP)-based Gigabit Ethernet ports and two SFP-based Enhanced Services (ES) ports (part number ME-C3750-24TE-M); AC (part number PWR-ME3750-AC) or DC (part number PWR-ME3750-DC) power required; integrated redundant power option; IP Base feature license; one rack unit (RU)

Figure 1. Cisco Catalyst 3750 Metro Series for Metro Ethernet Access

The built-in Gigabit Ethernet and ES ports accommodate a range of SFP gigabit interface converters, including 1000BASE-T, 1000BASE-¬SX, 1000BASE-LX/LH, 1000BASE-ZX, and 1000BASE-BX SFPs and both coarse wavelength-division multiplexing (CWDM) and dense wavelength-division multiplexing (DWDM) SFPs. The industry-standard Cisco SFP Gigabit Interface Converter is a hot-swappable input/output device that plugs into a Gigabit Ethernet port or slot, linking the port with the network.

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

The ES ports support enhanced features such as bidirectional Hierarchical QoS and Traffic Shaping, intelligent 802.1Q tunneling, VLAN translation, MPLS, EoMPLS, and H-VPLS. These ports can serve as uplinks to metro aggregation points, including the Cisco Catalyst 4500 and 6500 Series Switches and the Cisco 7600 Series Routers, and provide greater intelligence at the network edge.

Cisco Catalyst 3750 Metro Series Switches are shipped with the Metro IP Base Software license. The license includes Layer 2 switching and basic routing such as static routing, Routing Information Protocol (RIP), intelligent 802.1Q tunneling, VLAN translation, and bidirectional hierarchical QoS.

For greater service breadth and network flexibility, Cisco Catalyst 3750 Metro Series Switches offer additional software feature licenses that provide a cost-effective “pay-as-you-grow” service upgrade path. With the software feature license options on the Cisco Catalyst 3750 Metro Series, service providers are able to maximize the return on investment (ROI) for their Metro Ethernet networks by adding features as their profitability increases and service offerings expand.

Industry Standard Services

Carrier Ethernet is a huge growth area for emerging connectivity services. It is a comparatively simple, cost-effective, and familiar technology whose migration to the WAN will lead to more flexible network connectivity while reducing overall IT costs. However, its deployment is constrained by a shortage of global standards that provide assurance that equipment from different vendors will interoperate. In order to accelerate the adoption of Carrier Ethernet services and technology worldwide, service providers asked the Metro Ethernet Forum (MEF) to initiate a certification program to assure them and their customers that products are compliant with MEF specifications. The Cisco Catalyst 3750 Metro Series is certified to MEF 9 and 14 to support industry-standard Layer 2 services and QoS features.

Gigabit Ethernet

With more and more applications demanding higher bandwidth, both enterprise and residential customers are starting to demand access speeds greater than 100 Mbps. To address this requirement, the Cisco Catalyst 3750 Metro Series offers wire-speed Gigabit Ethernet with all the Metro Ethernet functionalities using the Gigabit Ethernet SFP ports. At speeds of 1000 Mbps, Gigabit Ethernet provides the bandwidth to meet new and evolving network demands, alleviate bottlenecks, and boost performance while protecting the existing infrastructure investments.

Layer 2 and Layer 3 VPN Services (Through Enhanced Services Ports)

Layer 2 VPN Using Enhanced 802.1Q Tunneling

802.1Q tunneling enables service providers to create a Layer 2 VPN service, often called Layer 2 transparent LAN services (TLS) or Ethernet LAN services, by using a VLAN-in-VLAN hierarchy and tagging the tagged packets. With 802.1Q tunneling, service providers can clearly separate their networks from their enterprise and commercial customer networks. Customer VLAN IDs are preserved, and traffic from different customers is segregated within the service provider infrastructure, even when they appear to be on the same VLAN. As a result, enterprise customers subscribing to the Layer 2 VPN can transparently send and receive traffic from other metropolitan sites through the service provider network as though the sites were within the same corporate LAN.

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

The Cisco Catalyst 3750 Metro Series supports an intelligent enhanced version of 802.1Q tunneling in which the enterprise customer's Layer 2 or Layer 3 QoS information can be mapped from the inner VLAN tag to the outer service provider VLAN tag. As a result, the enterprise customer's QoS priorities are used across the service provider's network. In addition, the Cisco Catalyst 3750 Metro Series supports Selective QinQ whereby the switch can assign a service provider VLAN tag to the customer traffic based on the ingress interface and customer's VLAN ID.

Layer 2 VPN Using VLAN Translation

VLAN translation is also used for Layer 2 VPN service. Instead of double-tagging the packet, the VLAN translation feature simply translates a customer VLAN ID to a service provider VLAN ID as the packet enters the service provider network, and vice versa as the packet exits the service provider network. By simply mapping the VLAN ID and leaving the rest of the packet untouched, the enterprise customer's QoS information can be preserved and honored as it traverses the service provider network.

Layer 2 VPN Using EoMPLS

EoMPLS is a tunneling mechanism that allows service providers to tunnel customer Layer 2 traffic through a Layer 3 MPLS network. This gives the service provider the best of both worlds—a Layer 2 TLS offering and the scalability of an MPLS core without needing a spanning tree. The Cisco Catalyst 3750 Metro Series supports EoMPLS on a per-port or per-VLAN basis, enabling service providers to build an end-to-end MPLS network all the way to the CLE.

Layer 2 VPN with H-VPLS Architecture

VPLS is a multipoint Layer 2 VPN technology that allows multiple sites to be connected over a simulated Ethernet broadcast domain that is supported across a provider-provisioned MPLS network. H-VPLS is one of IETF's VPLS standards that provides an MPLS-based distributed-PE architecture. H-VPLS has two design options:

- Ethernet access network: Access networks are 802.1Q networks, and the core network is MPLS.
- MPLS access network: Access networks and the core network are both MPLS.

The Cisco Catalyst 3750 Metro Series supports both architecture options as the PE-CLE switch in the H-VPLS access network.

Layer 3 VPN Using Multi-VRF CE

Multi–Virtual Routing and Forwarding Customer Edge (Multi-VRF CE), also called VRF-lite, on the Cisco Catalyst 3750 Metro Series enables the creation of a Layer 3 VPN service by keeping separate routing tables for each VPN customer without needing to run MPLS on the switch. Multi-VRF CE is a feature that allows a service provider to support two or more VPNs on a single Cisco Catalyst 3750 Metro Series switch, where IP addresses can be overlapped among the VPNs. Multi-VRF CE uses input interfaces to distinguish routes for different VPNs and forms virtual packet-forwarding tables by associating one or more Layer 3 interfaces with each VRF.

Layer 3 VPN Using MPLS VPN

The Cisco Catalyst 3570 Metro Series supports MPLS VPNs, allowing service providers to build true end-to-end MPLS networks and to offer MPLS VPN services to their enterprise and commercial customers. The MPLS VPN model is a true peer VPN model that enforces traffic separations by assigning unique VRFs to each customer's VPN. Thus, users in a specific VPN

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

cannot see traffic outside of that VPN. Traffic separation occurs without tunneling or encryption because it is built directly into the network.

Utmost SLA Support Using Traffic Shaping and Bidirectional Hierarchical Quality of Service (Through Enhanced Services Ports)

The ability to apply QoS criteria to network traffic is essential for service provider networks. As enterprises and service providers continue the shift to a single, converged network carrying mission-critical applications over a unified multiservice (data, voice, and video) architecture, the ability to manage traffic flows and delivery terms becomes increasingly critical. As enterprises outsource their network services to service providers, they will turn to providers who have the ability to supply QoS features to help ensure that on-demand, bandwidth-intensive applications and time-sensitive, information-delivery applications receive the bandwidth necessary to maintain performance. The ability to apply QoS to customer traffic will become vital to meeting SLAs and maintaining network performance. Support for advanced QoS features will also allow service providers to create premium products and service bundles. In addition, efficient application of QoS techniques reduces overall Metro Ethernet service costs through more efficient use of network links.

Cisco Catalyst 3750 Metro Series QoS technology facilitates the management of network performance with respect to bandwidth, delay, jitter, and packet loss, which are critical to optimizing application performance and meeting SLAs. The switch supports the Cisco Hierarchical Queuing Framework (HQF), which includes traffic classification, two-rate three-color policing, Class-Based Weighted Fair Queuing (CBWFQ), Low-Latency Queuing (LLQ), and traffic shaping on the output of the enhanced services ports. The hierarchical implementation of this framework enables service providers to manage their QoS at three different levels: at the physical interface level (enhanced services ports), the VLAN level (VLANs within each port), and marked class level (classes with each VLAN), providing the most granularity and flexibility to deliver their SLAs. In addition, congestion avoidance techniques such as Weighted Random Early Detection (WRED) and tail drop are supported to better regulate network traffic and prevent congestion.

Adding Differentiated Services over Time

Many service providers start their Metro Ethernet service portfolios by offering basic Layer 2 or Layer 3 services. As the services grow in popularity among enterprise and commercial customers and the competitive service offerings become more commonplace, it is essential that service providers broaden their service portfolios by adding more differentiated services. By providing several optional software licenses with enhanced features, Cisco Catalyst 3750 Metro Series Switches enable service providers to build an intelligent network without having to incur a high initial capital expenditure (CapEx). Service providers can begin selling their Metro Ethernet services with basic features and SLAs. As their services become more profitable, they can gradually increase the service offerings by purchasing the software licenses with additional features, without the need to do costly complete equipment upgrades.

With the flexibility and scalable architecture of the Cisco Catalyst 3750 Metro Series, service providers can build a more future-proof Metro Ethernet network, and, as their Metro Ethernet services evolve, the network can be upgraded without replacing the metro access equipment.

Multiple Software Feature Images to Provide Flexible Deployment Options

The Cisco Catalyst 3750 Metro Series Switches offer three different Cisco IOS® Software feature images, METROBASE, METROACCESS, and METROIPACCESS, providing cost-effective, pay-

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

as-you-grow service upgrade options for service providers deploying multiple services. The service providers do not have to pay for the features they do not need today and still have the option in the future to receive those features with a simple software upgrade.

Support for multiple software feature images allows service providers to standardize on the Cisco Catalyst 3750 Metro Series Switches, save on the OpEx of stocking multiple products, simplify training of support technicians, and alleviate complications in supporting different products for different services.

Table 1 lists primary features in the Cisco IOS Software images for Cisco Catalyst 3750 Metro Series.

Table 1. Primary Features in Cisco IOS Software Images for Cisco Catalyst 3750 Metro Series

IP BASE	IP SERVICES	ADVANCED IP SERVICES
L2 Switching	IP BASE +	IP SERVICES +
Intelligent 802.1Q Tunneling	Advanced IP Routing (BGP, IS-IS, EIGRP, OSPF)	MPLS
Hierarchical Queuing Framework	Multi-VRF CE	MPLS VPN
VLAN Mapping	Hot Standby Router Protocol	EoMPLS
Control Plane Security	PIM	MPLS OAM and RFC 4379 support
Private VLAN	DVMRP Tunneling	Pseudowire redundancy
Ethernet OAM	Embedded Event Manager	–
RIP and Static Routing	IP Multicast support for multi-VRF CE	–
Resilient Ethernet Protocol	VRF Aware Services	–
IP SLA	Source Specific Multicast	–
Ethernet IP SLA	Source Specific Multicast Mapping	–
IP SLA LSP Monitor	IGMP Proxy	–
IP SLA Enhanced Object Tracking	–	–
DHCP Snooping Statistics	–	–
Configuration Rollback	–	–
DHCP Based Auto Configuration and Image Update		
Configurable Control Plane Queue Assignment		

Multiple software feature images support the pay-as-you-grow deployment model.

Increased Service Availability with Redundant Power Supplies

Cisco Catalyst 3750 Metro Series Switches can be equipped with an optional internal redundant power supply, available in both AC and DC versions. The internal power supply redundancy provides service providers with an immediate failover capability in the case of a power supply failure. The power redundancy decreases the chance of service outage and allows the service provider to offer an SLA with a higher level of service availability.

The power supplies of Cisco Catalyst 3750 Metro Series Switches are also field replaceable and hot swappable, allowing service providers to replace a failed power supply without interrupting their customers' services. The redundant power supplies, with the flexibility features built into the Cisco Catalyst 3750 Metro Series, enable service providers to build a resilient, highly available network.

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

Security Across the Service Portfolio with Granular Control for the Access Environment

The Cisco Catalyst 3750 Series supports a comprehensive set of security features for connectivity and access control, including access control lists (ACLs), authentication, port-level security, and identity-based network services with 802.1X and extensions. The ACLs allow service providers to restrict unwanted traffic into their networks by denying packets based on source and destination MAC addresses, IP addresses, or TCP/User Datagram Protocol (UDP) ports. All ACL lookups are done in hardware, so forwarding and routing performance is not compromised when implementing ACL-based security in the network.

Robust Service Management Options

The Cisco Catalyst 3750 Metro Series provides outstanding service management capabilities through Cisco CNS 2100 Series Intelligence Engine support and Simple Network Management Protocol (SNMP). Service providers will be able to smoothly integrate the Cisco Catalyst 3750 Metro Series into their operations support systems (OSSs) and enable improved flow-through provisioning. The Cisco CNS 2100 Series network device allows service providers to effectively manage a network of Cisco IOS Software devices, including the Cisco Catalyst 3750 Metro Series. It is a completely self-contained unit that includes a task-oriented Web GUI, a programmable Extensible Markup Language (XML) interface, configuration template management, and an embedded repository. For comprehensive in-band management, service providers also can manage the Cisco Catalyst 3750 Metro Series using SNMP Version 2 and Version 3 and the Telnet interface. A CLI-based management console provides detailed out-of-band management.

For service provisioning on the Cisco Catalyst 3750 Metro Series, service providers can use Cisco IP Solution Center (ISC). Cisco IP Solution Center is a family of intelligent network management applications that help reduce overall administration and management costs by providing automated resource management and rapid profile-based provisioning capabilities that speed deployment and time to market of MPLS and Metro Ethernet technologies.

Ethernet Operations, Administration, Maintenance, and Provisioning

The advent of Ethernet as a metropolitan and wide-area networking technology has accelerated the need for a new set of operations, administration, maintenance, and provisioning (OAM&P) protocols. Service provider networks are large and complex with a wide user base, and they often involve different operators that must work together to provide end-to-end services to enterprise customers. As enterprise end customers demand higher availability of services, service providers must reduce the mean time to repair (MTTR) and increase service availability. Ethernet OAM&P features address these challenges and enable service providers to offer carrier-grade services.

The Cisco Catalyst 3750 Metro Series supports industry-standard OAM&P tools, including 802.1ag Connectivity Fault Management and Ethernet Local Management Interface (E-LMI) protocol. 802.1ag provides the tools to monitor and troubleshoot end-to-end Ethernet networks. It allows service providers to check for end-to-end connectivity, isolate network issues, and identify customers affected by network issues. The E-LMI protocol, developed by the MEF, has substantial benefits to both the service provider as well as the end customer. E-LMI enables the service provider to automatically configure the customer-edge and CPE devices to match the subscribed service. This automatic provisioning not only reduces the effort to set up the service, but also reduces the amount of coordination required between the service provider and enterprise customer.

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

IP Service Level Agreement (IP SLA)

Cisco IOS Software IP SLAs help enable customers to assure new business-critical IP applications, as well as IP services that utilize data, voice, and video. With Cisco IOS Software IP SLAs, users can verify service guarantees, increase network reliability by validating network performance, proactively identify network issues, and increase return on investment (ROI) by easing the deployment of new IP services. Cisco IOS Software IP SLAs use active monitoring to generate traffic in a continuous, reliable, and predictable manner, thus facilitating the measurement of network performance and health.

The IP SLA for Metro-Ethernet feature provides the capability to gather Ethernet layer network performance metrics. This feature integrates Cisco IOS Software IP SLAs with the Ethernet Connectivity Fault Management (CFM) feature. Available statistical measurements for the IP SLAs Ethernet operation include round-trip time, jitter (interpacket delay variance), and packet loss.

Resilient Ethernet Protocol

Resilient Ethernet Protocol (REP) is a Cisco proprietary protocol that provides an alternative to Spanning Tree Protocol to control network loops, handle link failures, and improve convergence time. REP is designed to meet service providers' requirement for a fast and predicable reconvergence solution for Layer 2 networks. In addition, REP also supports VLAN load balancing to provide efficient utilization of redundant links.

Applications

VPNs allow customers at different locations to exchange information through a service provider network, without requiring private connections. The Cisco Catalyst 3750 Metro Series is ideal for service provider Metro Ethernet access deployments, allowing providers to offer Layer 2 or Layer 3 VPN services to their enterprise or commercial customers. Typically, Cisco Catalyst 3750 Metro Series Switches are installed in a building basement serving many customers in the building or at the customer premises as the customer-located equipment (CLE).

Figure 2 shows a deployment example using the Cisco Catalyst 3750 Metro Series for Layer 2 VPN service.

Figure 2. Layer 2 VPN on the Cisco Catalyst 3750 Metro Series

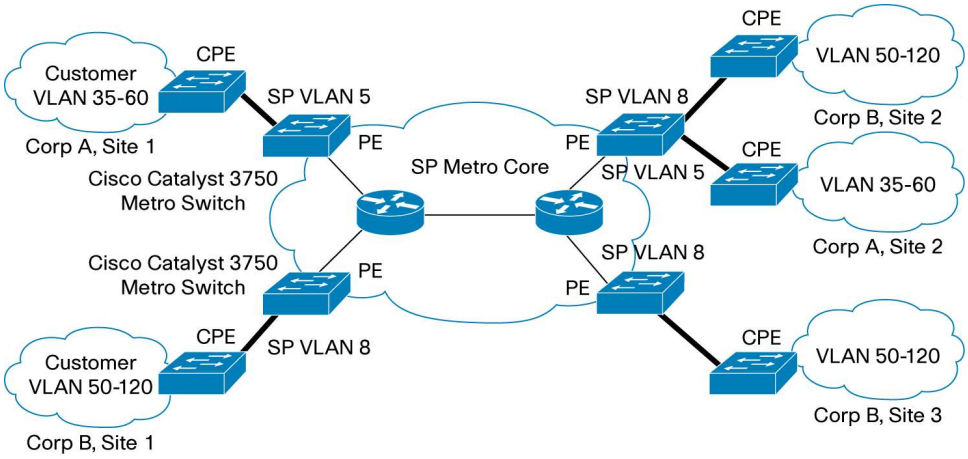
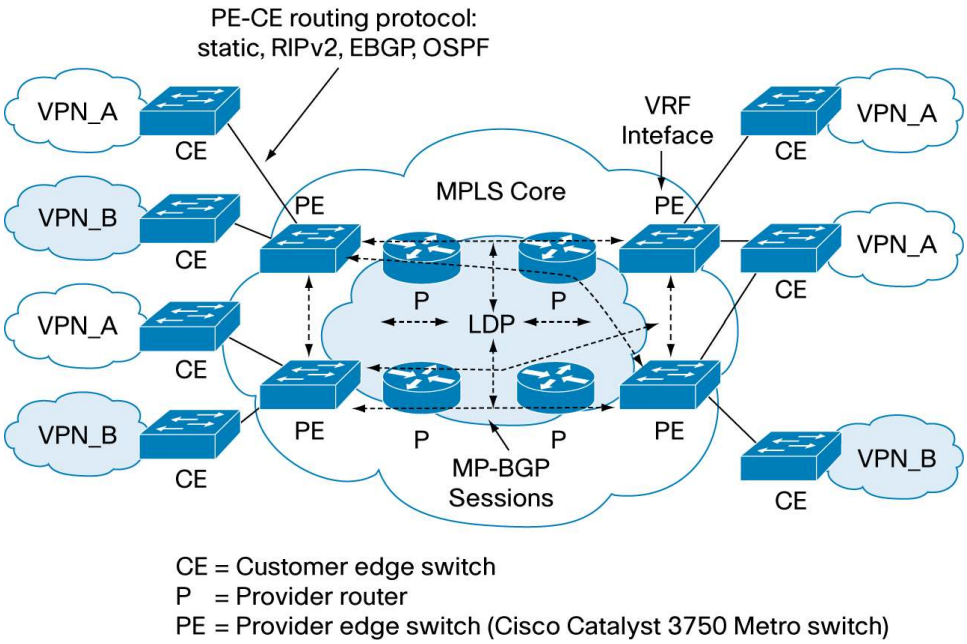


Figure 3 shows a network example of using the Cisco Catalyst 3750 Metro Series for Layer 3 MPLS VPN service.

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

Figure 3. Layer 3 MPLS VPN on the Cisco Catalyst 3750 Metro Series



Primary Features and Benefits

Table 2 gives features and benefits of the Cisco Catalyst 3750 Metro Series.

Table 2. Features and Benefits

Feature	Benefit
Purpose-Built Next-Generation Ethernet Access Switches for Metro Ethernet Market	• Compact form factor (17.5 in. x 14.75 inx 1RU) allows for deployment in space-limited areas. • Redundant AC, redundant DC, or mixed AC/DC available. • Software is optimized for Metro Ethernet access. • Three software feature images help enable support for breadth of services. • Software upgrade options allow service providers to purchase only the features needed today while retaining the option to obtain other features through simple software upgrades. • Upgrade options reduce service providers' OpEx by lowering the supporting cost for different products and also reducing the number of different products needed for sparing. • IP BASE software feature image is designed for layer 2 switching and advanced QoS. • IP Services software feature image is designed for advanced IP routing. • Advanced IP Services software feature image is designed for MPLS VPN services.
Service Breadth	
Triple-Play Services	• Advanced QoS functionalities to provide differentiated class of service treatment to support triple-play service. • Multicast VLAN Registration (MVR) reduces overall bandwidth requirement for multicast distribution in ring based networks. • Comprehensive security solution to provide protection of subscribers, switch, and network at the network edge. • Source Specific Multicast (SSM) reduces the need for IP Multicast address management and prevents DoS attacks against receivers. • SSM mapping provides a mapping of source to group, which allows listeners to find/connect to multicast sources dynamically, reducing dependencies on the application.
Intelligent Ethernet Demarcation	• Industry standard OAM&P 802.1ag (CFM) feature supports end-to-end network monitoring and troubleshooting. This greatly reduces OpEx for service providers by reducing the numbers of site visits needed to troubleshoot network problems. • E-LMI enables the service provider to automatically configure the customer-edge and CPE devices to match the subscribed service.

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

Layer 2 VPN Service	• Standard 802.1Q Tunneling creates a hierarchy of 802.1Q tags. This feature helps service providers use a single VLAN to support customers who have multiple VLANs, while preserving customer VLAN IDs and segregating traffic from different customers within the service provider infrastructure even when they appear to be on the same VLAN. • Selective QinQ gives service providers more flexibility in segregating customer traffic in the network. • L2PT allows for transport of the customers' control protocols, thereby allowing for a true virtual-circuit service across service providers' shared infrastructure.
Layer 3 VPN Service	• Multi-VRF CE (VRF-lite) forms virtual packet-forwarding tables by associating one or more Layer 3 interfaces with each VRF, allowing the creation of multiple Layer 3 VPNs on a single Cisco Catalyst 3750 Metro Series Switch. Interfaces in a VRF could be either physical, as in an Ethernet port, or logical, as in a VLAN switch virtual interface (SVI)—requiring the METROIPACCESS Cisco IOS Software feature image. • IP Multicast support in Multi-VRF CE allows customers to migrate to Multi-VRF CE without affecting application and services that depend on IP Multicast. • VRF-aware services (ARP, Ping, SNMP, HSRP, uRPF, Syslog, Traceroute, FTP, and TFTP). • Support for multiple IP routing protocols (RIPv1/v2, EIGRP, OSPF, IS-IS, and BGPv4) offers flexible options for peering between end customers and service providers.
Availability and Scalability	
Superior Redundancy for Fault Backup	• IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) provides rapid spanning-tree convergence independent of spanning-tree timers and offers the benefit of distributed processing. • Per-VLAN Rapid Spanning Tree (PVRST+) allows rapid spanning-tree reconvergence on a per-VLAN spanning-tree basis, without requiring the implementation of spanning-tree instances. • Cisco Hot Standby Router Protocol (HSRP) is supported to create redundant, fail-safe routing topologies. • Unidirectional Link Detection Protocol (UDLD) and Aggressive UDLD allow unidirectional links caused by incorrect fiber-optic connections or port faults to be detected and disabled on fiber-optic interfaces. • Flex-Link provides fast failover of ports without overhead of control protocols such as the Spanning Tree Protocol. • VLAN Flex-Link Load Balancing provides high availability and load balancing based on VLAN. • Switch-port autorecovery (errdisable) automatically attempts to reactivate a link that is disabled because of a network error. • Equal-cost routing provides for load balancing and redundancy. • Bandwidth aggregation up to 800 Mbps through Cisco Fast EtherChannel® technology enhances fault tolerance and offers higher-speed aggregated bandwidth between switches and to routers and individual servers. • Accelerate Layer 3 reconvergence through the use of Link-State Tracking by taking down associated downstream ports when all the corresponding upstream ports are down. Customer switches that are connected to the downstream ports can then take the appropriate failover action. • Resilient Ethernet Protocol (REP) provides fast Layer 2 reconvergence in a ring network and offers an alternative to Spanning Tree Protocol. • Pseudowire redundancy enables service providers to configure their Multiprotocol Label Switching) MPLS network to detect a failure in the network and reroute Layer 2 service to another endpoint that can continue to provide service.
High-Performance IP Routing	• Cisco Express Forwarding hardware routing architecture delivers extremely high-performance IP routing. • Basic IP Unicast routing protocols (static and RIP versions 1 and 2) are supported for small-network routing applications. • Advanced IP Unicast routing protocols (OSPF, EIGRP, IS-IS, and BGPv4) are supported for load balancing and constructing scalable LANs. • Hot Standby Router Protocol (HSRP) provides dynamic load balancing and failover for routed links; up to 32 HSRP links are supported per unit. • Inter-VLAN IP routing provides for full Layer 3 routing between two or more VLANs. • Protocol Independent Multicast (PIM) for IP Multicast routing is supported, including PIM sparse mode (PIM-SM), PIM dense mode (PIM-DM), and PIM sparse-dense mode. The Cisco IOS Software IP Services image is required. • Cisco recommends 128 switch virtual interfaces (SVIs). A maximum of 1000 are supported (depending on the number of routes and multicast entries).

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

Multicast	
Efficient Multicast Distribution	• Multicast VLAN Registration provides efficient multicast distribution in ring networks by dedicating a single VLAN for multicast traffic, thereby removing duplicate multicast traffic in other VLANs. • PIM-SM provides efficient routing of multicast traffic by establishing distribution trees across WANs. • Source Specific Multicast (SSM) reduces the need for IP Multicast address management and prevents DoS attacks against receivers. • SSM mapping provides a mapping of source to group, which allows listeners to find/connect to multicast sources dynamically, reducing dependencies on the application.
Robust Multicast Control	• IGMP Snooping helps enable intelligent management of multicast traffic by examining IGMP messages. • IGMP Fast Leave provides a fast channel-changing capability for IPTV services. • IGMP filtering provides control of groups each user can access. • IGMP Throttling controls the maximum number of multicast groups each user can access. • IGMP Proxy allows users anywhere on a downstream network to join an upstream sourced multicast group.
QoS and Control	
Advanced QoS	• Standard 802.1p class of service (CoS) and differentiated services code point (DSCP) field classification are provided, using marking and reclassification on a per-packet basis by source and destination IP address, source and destination MAC address, VLAN ID, or Layer 4 TCP/User Datagram Protocol (TCP/UDP) port number. • Cisco control-plane and data-plane QoS ACLs on all ports help ensure proper marking on a per-packet basis. • Shaped Round Robin (SRR) scheduling helps ensure differential prioritization of packet flows by intelligently servicing the queues. • Weighted Tail Drop (WTD) provides per QoS class congestion avoidance at the queues before a disruption occurs. • Priority queue rate limiting provides optional protection against lower priority queue starvation. • The ES ports offer the following additional functionalities: ◦ Hierarchical QoS with traffic classification, policing, queuing, shaping, and scheduling at the class, VLAN, and interface level ◦ Traffic classification based on MPLS experimental (EXP) bits ◦ 2 Rate 3 Color policing ◦ WRED (Weighted Random Early Detection) for congestion avoidance ◦ Class-Based Weighed Fair Queuing (CBWFQ) for bandwidth management ◦ Low-Latency Queue provides strict-priority queuing for delay sensitive data • Configurable control plane queue assignment allows service providers to assign control plane traffic to specific egress queue. • Prioritization of control plane traffic enables service providers to set QoS markings globally for CPU-generated traffic so these protocol packets will receive priority in the network. • There is no performance penalty for advanced QoS functionalities.
Advanced Traffic Control	• Upstream and downstream traffic flows from the end station or the uplink are easily managed using ingress policing and egress shaping. • Ingress policing provides bandwidth monitoring in increments as low as 8 kbps. • Ingress policing is provided based on CoS, VLAN ID, DSCP, and QoS ACLs (IP ACLs or MAC ACLs), which can include source and destination IP address, source and destination MAC address, Layer 4 TCP/UDP information, or any combination of these fields. • Egress Weighted Fair Queuing guarantees the Committed Information Rate (CIR) between traffic flows and queues. • Egress shaping for each queue provides smooth traffic control of available bandwidth. • Egress port rate limiting allows the service provider to control the traffic rate that is transmitted out of the port.

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

Network Security	
Comprehensive Security Solutions	Subscriber Security • IEEE 802.1x allows dynamic, port-based security by providing user authentication. • IEEE 802.1x with VLAN assignment allows a dynamic VLAN assignment for a specific user regardless of where the user is connected. • IEEE 802.1x and port security are provided to authenticate the port and manage network access for all MAC addresses. • IEEE 802.1x readiness check simplifies deployment by generating a report for end hosts capable of 802.1x. • An absence of local switching behavior provides security and isolation between UNIs, helping ensure that users cannot monitor or access other users' traffic on the same switch. • DHCP Snooping prevents malicious users from spoofing a DHCP server and sending out bogus addresses. This feature also prevents numerous other attacks such as Address Resolution Protocol (ARP) poisoning. • Dynamic ARP Inspection helps ensure user integrity by preventing malicious users from exploiting the insecure nature of the ARP protocol. • IP Source Guard prevents a malicious user from spoofing or taking over another user's IP address by creating a binding table between client's IP and MAC address, port, and VLAN. Switch Security • Control Plane Security prevents DoS attacks on the CPU. • Secure Shell (SSH) Protocol, Kerberos, and SNMPv3 provide network security by encrypting administrator traffic during Telnet and SNMP sessions. SSH, Kerberos, and the cryptographic version of SNMPv3 require a special cryptographic software image because of U.S. export restrictions. • Port security secures the access to an access or trunk port based on MAC address. After a specific timeframe, the aging feature removes the MAC address from the switch to allow another device to connect to the same port. • Multilevel security on the console access prevents unauthorized users from altering the switch configuration. • TACACS+ and RADIUS authentication facilitate centralized control of the switch and restrict unauthorized users from altering the configuration. • Configuration File Security helps ensure that only authenticated users have access to the configuration file. • Per VLAN MAC address learning prevents MAC address table overflow attack. Network Security • Cisco security VLAN ACLs on all VLANs prevent unauthorized data flows from being bridged within VLANs. • Cisco standard and extended IP security router ACLs define security policies on routed interfaces for control-plane and data-plane traffic. • Port-based ACLs for Layer 2 interfaces allow for application of security policies on individual switch ports. MAC address notification allows administrators to be notified of users added to or removed from the network. Network Monitoring • Remote Switched Port Analyzer (RSPAN) allows for remote monitoring of the user interface. Bidirectional data support on the Switched Port Analyzer (SPAN) port allows the Cisco intrusion detection system (IDS) to take action when an intruder is detected.

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

Manageability	
Superior Manageability	• The Cisco IOS Software CLI provides a common user interface and command set with all Cisco routers and Cisco Catalyst desktop switches. • Service Assurance Agent (SAA) provides service-level management throughout the network. • IEEE 802.1ag Connectivity Fault Management provides standard support for transport fault management. It allows for discovery and verification of path for Layer 2 services. • Ethernet Local Management Interface enables auto configuration of CPE by CLE to support Metro Ethernet services. • IEEE 802.3ah Ethernet in the First Mile provides standard support for monitoring, remote failure indication, loopback, and OAM discovery on the link between the customer equipment and service provider network. • Switching Database Manager templates for Layer 2 and Layer 3 deployment allow the administrator to easily optimize memory allocation to the desired features based on deployment-specific requirements. • VLAN trunks can be created from any port, using standards-based 802.1Q tagging. Up to 1005 VLANs per switch and up to 128 spanning-tree instances per switch are supported. • Four thousand VLAN IDs are supported. • RSPAN allows administrators to remotely monitor ports in a Layer 2 switch network from any other switch in the same network. • For enhanced traffic management, monitoring, and analysis, the embedded Remote Monitoring (RMON) software agent supports four RMON groups (history, statistics, alarms, and events). • Layer 2 traceroute eases troubleshooting by identifying the physical path that a packet takes from source to destination. • MPLS OAM supports service providers to quickly troubleshoot and monitor MPLS networks. • All nine RMON groups are supported through a SPAN port, permitting traffic monitoring of a single port, a group of ports, or the entire stack from a single network analyzer or RMON probe. • Domain Name System (DNS) provides IP address resolution with user-defined device names. • Trivial File Transfer Protocol (TFTP) reduces the cost of administering software upgrades by downloading from a centralized location. • Network Timing Protocol (NTP) provides an accurate and consistent time stamp to all intranet switches. • The Cisco Catalyst 3750 Metro Series supports the Cisco CNS 2100 Series Intelligence Engine and SNMP for networkwide management. • Cisco IP Solution Center (ISC) applications help reduce overall administration and management costs by providing automated resource management and rapid profile-based provisioning capabilities. • Configuration Rollback helps in error recovery by providing the capability to replace the current running configuration with any saved Cisco IOS Software configuration file. • Embedded Event Manager (EEM) offers the ability to monitor events and take user-defined action when the monitored events occur or a threshold is reached. • Dynamic Host Configuration Protocol (DHCP) based auto configuration and image update simplifies management of large number of switches by automatically downloading specified configuration and image. • Digital optical monitoring (DOM) support provides a service provider with the capability to perform in-service transceiver monitoring and troubleshooting operations.
CiscoWorks Support	• CiscoWorks network management software provides management capabilities on a per-port and per-switch basis, providing a common management interface for Cisco routers, switches, and hubs. • SNMP versions 1, 2c, and 3 and Telnet provide comprehensive in-band management, and a CLI-based management console provides detailed out-of-band management. • Cisco Discovery Protocol versions 1 and 2 help enable automatic switch discovery for a CiscoWorks network management station. • The CiscoWorks 2000 LAN Management Solution is supported.

Product Specifications

Table 3 lists product specifications for the Cisco Catalyst 3750 Metro Series Switches.

Table 3. Product Specifications

Description	Specification

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

Performance	• Forwarding rate: 8.55 mpps • 128-MB DRAM and 32-MB flash memory • 64-MB DRAM enhances services port memory • Configurable up to 12,000 MAC addresses • Configurable up to 11,000 unicast routes • Configurable up to 1,000 IGMP groups and multicast routes • Configurable maximum transmission unit (MTU) of up to 9000 bytes for bridging on Gigabit Ethernet ports and up to 1998 bytes for bridging and routing on Fast Ethernet ports
Connectors and Cabling	**10/100 Ports:** • 10BASE-T ports: RJ-45 connectors, 2-pair Category 3, 4, or 5 unshielded twisted-pair (UTP) cabling • 100BASE-TX ports: RJ-45 connectors, 2-pair Category 5 UTP cabling **SFP Ports:** • 1000BASE-T SFP-based ports: RJ-45 connectors, 2-pair Category 5 UTP cabling • 1000BASE-BX: Single-fiber LC receptacle connector (single-mode fiber) • 1000BASE-SX, -LX, and –ZX and CWDM and DWDM: Duplex LC receptacle fiber connectors (multimode and single-mode fiber) • 100FX SFP on GE SFP ports (only non-ES SFP ports) • Management console port: RJ-45-to-DB9 cable for PC connections
Indicators	• Per-port status LEDs: Link integrity, port disabled, and activity indications • System-status LED
Dimensions (H x W x D)	1.73 x 17.5 x 14.68 in. (4.39 x 44.5 x 37.3 cm)
Weight	12.1 lb (5.49 kg) (Cisco Catalyst 3750 Metro 24-AC or DC)
Mean Time Between Failure (MTBF)	• 168,231 hours (one power supply) • 256,311 hours (two power supplies)

Power Specifications

Table 4 gives power specifications for the Cisco Catalyst 3750 Metro Series.

Table 4. Power Specifications

Description	Specification
Power Consumption	110W (maximum), 374 BTUs per hour (Cisco Catalyst 3750 Metro 24-AC or DC Switch)
AC Input Voltage and Frequency	100 to 127/200 to 240 VAC (autoranging), 50 to 60 Hz (Cisco Catalyst 3750 Metro 24-AC)
DC Input Voltages	–36 to –72 VDC @ 3A (Cisco Catalyst 3750 Metro 24-DC)

Management and Standards

Table 5 provides management and standards support information for the Cisco Catalyst 3750 Metro Series.

Table 5. Management and Standards

Description	Specification
Management	• BRIDGE-MIB (RFC1493) • BGP4-MIB (RFC1657) • CISCO-BULK-FILE-MIB

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

	• CISCO-CABLE-DIAG-MIB • CISCO-CDP-MIB • CISCO-CONFIG-COPY-MIB • CISCO-CONF-MAN-MIB • CISCO-DATA-COLLECTION-MIB • CISCO-ENVMON-MIB • CISCO-ERR-DISABLE-MIB • CISCO-ETHERNET-ACCESS-MIB • CISCO-FLASH-MIB • CISCO-FTP-CLIENT-MIB • CISCO-HSRP-MIB • CISCO-HSRP-EXT-MIB • CISCO-IGMP-FILTER-MIB • CISCO-IPLSA-ETHERNET-MIB • CISCO-PAGP-MIB • CISCO-PAE-MIB • CISCO-PING-MIB • CISCO-PRIVATE-VLAN-MIB • CISCO-PROCESS-MIB • CISCO-PORT-QOS-MIB • CISCO-PORT-SECURITY-MIB • CISCO-PORT-STORM-CONTROL-MIB • CISCO-IMAGE-MIB • CISCO-LAG-MIB • CISCO-L2L3-INTERFACE-CONFIG-MIB • CISCO-MAC-NOTIFICATION-MIB • CISCO-MEMORY-POOL-MIB • CISCO-RTTMON-MIB • CISCO-STACK-MIB • CISCO-STP-EXTENSIONS-MIB • CISCO-SYSLOG-MIB • CISCO-TCP-MIB • CISCO-UDLDP-MIB • CISCO-VLAN-IFTABLE-RELATIONSHIP-MIB • CISCO-VLAN-MEMBERSHIP-MIB • ENTITY-MIB (RFC2737) • ETHERLIKE-MIB • IEEE8021-PEA-MIB • IEEE8023-LAG-MIB • IF-MIB (RFC 1573) • IGMP-MIB • IPMROUTE-MIB • OLD-CISCO-CHASSIS-MIB • OLD-CISCO-FLASH-MIB • OLD-CISCO-INTERFACES-MIB • OLD-CISCO-IP-MIB • OLD-CISCO-SYS-MIB • OLD-CISCO-TCP-MIB • OLD-CISCO-TS-MIB • OSPF-MIB (RFC 1253) • PIM-MIB

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

	• RFC1213-MIB (MIB-II) • RMON-MIB (RFC 1757) • RMON2-MIB (RFC 2021) • SNMP-FRAMEWORK-MIB (RFC2571) • SNMP-MPD-MIB (RFC 2572) • SNMP-NOTIFICATION-MIB (RFC 2573) • SNMP-TARGET-MIB (RFC 2573) • SNMPv2-MIB (RFC 1907) • SNMP-USM-MIB (SNMP-USER-BASED-SM-MIB) (RFC2574) • SNMP-VACM-MIB (SNMP-VIEW-BASED-ACM-MIB) (RFC2575) • TCP-MIB (RFC 2012) • UDP-MIB (RFC 2013)
Standards and Protocols	• IEEE 802.1s • IEEE 802.1w • IEEE 802.1x • IEEE 802.3ad • IEEE 802.3ah • IEEE 802.1ag • IEEE 802.3x full duplex on 10BASE-T, 100BASE-TX, and 1000BASE-T ports • IEEE 802.1D Spanning Tree Protocol • IEEE 802.1p CoS classification • IEEE 802.1Q VLAN • IEEE 802.3 10BASE-T • IEEE 802.3u 100BASE-T • IEEE 802.3ab 1000BASE-T • IEEE 802.3z 1000BASE-X • IP routing: Static, RIP versions 1 and 2, EIGRP, OSPF, BGPv4, PIM-SM, and PIM-DM (metro IP access only) • Management: SNMP versions 1, 2, and 3

Safety and Compliance

Table 6 gives safety and compliance information for the Cisco Catalyst 3750 Metro Series.

Table 6. Safety and Compliance

Type	Standards
Electromagnetic Emissions Compliance (EMC)	• FCC Part 15 Class A, • EN 55022B Class A (CISPR22 Class A) • GR-1089 CORE Class A • VCCI Class I • AS/NZS 3548 Class A or AS/NZS CISPR22 Class A • BSMI Class A • MIC • CE Marking
Safety	• UL 60950, Third Edition • UL to CAN/CSA 22.2 No.60950, Third Edition • TUV/GS to EN 60950 with Amendment A1-A4 and A11 • CB to IEC 60950 with all country deviations • NOM to NOM-019-SCFI • AS/NZS 3260, TS001 • CE Marking • CLEI Coding
NEBS	GR-63-CORE and GR-1089-CORE—Level 3, Type 2
ETSI	EN 300 019—Storage: Class 1.2, Transportation: Class 2.3, In-Use: Class 3.2
Noise Specifications	Office product specification: 50dBA

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

Operating Environment	• Temperature: ◦ 0 to +45ºC ◦ -5 to +55ºC (NEBS short-term operation) • Altitude: Up to 10,000 ft (3000m) • Relative humidity: ◦ 10 to 85% non-condensing ◦ 5 to 95% non-condensing (NEBS short-term operation)
Storage Environment	• Temperature: ◦ -25 to 70ºC ◦ -40 to 70ºC (NEBS short-term operation) • Altitude: 15,000 ft (4570m)

Ordering Information

Table 7 lists the ordering information for the Cisco Catalyst 3750 Metro. To place an order, visit the Cisco ordering homepage at http://www.cisco.com/en/US/ordering/or13/or8/order_customer_help_how_to_order_listing.html.

Table 7. Ordering Information

Part Number	Description
ME-C3750-24-TE-M	• 24 Ethernet 10/100 ports • 2 SFP-based Gigabit Ethernet ports • 2 SFP-based Enhanced GE Service Ports • 8.55 mpps forwarding rate • Purpose-built Gigabit Ethernet access switch for the Metro Ethernet market • 3 Cisco IOS Software feature image options (IP BASE, IP SERVICES, and ADVANCED IP SERVICES)
ME3750-ADVIP-LIC=	Cisco Catalyst 3750 Metro Advanced IP Services Feature license
ME3750-IPSVC-LIC=	Cisco Catalyst 3750 Metro IP Services Feature license
ME3750-UPGRD-LIC=	Cisco Catalyst 3750 Metro IP Services to Advanced IP Upgrade license
PWR-ME3750-AC	Cisco Catalyst 3750 Metro Switch Primary AC power supply
PWR-ME3750-DC	Cisco Catalyst 3750 Metro Switch Primary DC power supply
PWR-ME3750-AC-R	Cisco Catalyst 3750 Metro Switch Redundant AC power supply (optional)
PWR-ME3750-DC-R	Cisco Catalyst 3750 Metro Switch Redundant DC power supply (optional)
PWR-ME3750-AC=	Cisco Catalyst 3750 Metro Switch AC power supply (spare)
PWR-ME3750-DC=	Cisco Catalyst 3750 Metro Switch DC power supply (spare)
GLC-LH-SM=	Gigabit Ethernet SFP, LC connector, and LH transceiver
GLC-SX-MM=	Gigabit Ethernet SFP, LC connector, and SX transceiver
GLC-ZX-SM=	Gigabit Ethernet SFP, LC connector, and ZX transceiver
GLC-T=	Gigabit Ethernet SFP, RJ-45 connector, and 10/100/1000BASE-T transceiver
GLC-BX-D=	1000BASE-BX10 SFP module for single-strand SMF, 1490-nm TX/1310-nm RX wavelength
GLC-BX-U=	1000BASE-BX10 SFP module for single-strand SMF, 1310-nm TX/1490-nm RX wavelength
GLE-GE-100FX=	100BASE-FX (multimode fiber) (works in “multi-speed” Gigabit Ethernet SFP ports of other Cisco platforms such as the Cisco Catalyst 3560, Catalyst 3750 (non-metro), and Catalyst 2970)
CWDM-SFP-1470=	Cisco CWDM SFP, 1470 nm; Gigabit Ethernet and 1-/2-GB Fibre Channel (gray)
CWDM-SFP-1490=	Cisco CWDM SFP, 1490 nm; Gigabit Ethernet and 1-/2-GB Fibre Channel (violet)
CWDM-SFP-1510=	Cisco CWDM SFP, 1510 nm; Gigabit Ethernet and 1-/2-GB Fibre Channel (blue)
CWDM-SFP-1530=	Cisco CWDM SFP, 1530 nm; Gigabit Ethernet and 1-/2-GB Fibre Channel (green)
CWDM-SFP-1550=	Cisco CWDM SFP, 1550 nm; Gigabit Ethernet and 1-/2-GB Fibre Channel (yellow)
CWDM-SFP-1570=	Cisco CWDM SFP, 1570 nm; Gigabit Ethernet and 1-/2-GB Fibre Channel (orange)
CWDM-SFP-1590=	Cisco CWDM SFP, 1590 nm; Gigabit Ethernet and 1-/2-GB Fibre Channel (red)
CWDM-SFP-1610=	Cisco CWDM SFP, 1610 nm; Gigabit Ethernet and 1-/2-GB Fibre Channel (brown)

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

DWDM-SFP-6061=	Cisco DWDM SFP 1560.61 nm SFP (100 GHz ITU grid)
DWDM-SFP-5979=	Cisco DWDM SFP 1559.79 nm SFP (100 GHz ITU grid)
DWDM-SFP-5898=	Cisco DWDM SFP 1558.98 nm SFP (100 GHz ITU grid)
DWDM-SFP-5817=	Cisco DWDM SFP 1558.17 nm SFP (100 GHz ITU grid)
DWDM-SFP-5655=	Cisco DWDM SFP 1556.55 nm SFP (100 GHz ITU grid)
DWDM-SFP-5575=	Cisco DWDM SFP 1555.75 nm SFP (100 GHz ITU grid)
DWDM-SFP-5494=	Cisco DWDM SFP 1554.94 nm SFP (100 GHz ITU grid)
DWDM-SFP-5413=	Cisco DWDM SFP 1554.13 nm SFP (100 GHz ITU grid)
DWDM-SFP-5252=	Cisco DWDM SFP 1552.52 nm SFP (100 GHz ITU grid)
DWDM-SFP-5172=	Cisco DWDM SFP 1551.72 nm SFP (100 GHz ITU grid)
DWDM-SFP-5092=	Cisco DWDM SFP 1550.92 nm SFP (100 GHz ITU grid)
DWDM-SFP-5012=	Cisco DWDM SFP 1550.12 nm SFP (100 GHz ITU grid)
DWDM-SFP-4851=	Cisco DWDM SFP 1548.51 nm SFP (100 GHz ITU grid)
DWDM-SFP-4772=	Cisco DWDM SFP 1547.72 nm SFP (100 GHz ITU grid)
DWDM-SFP-4692=	Cisco DWDM SFP 1546.92 nm SFP (100 GHz ITU grid)
DWDM-SFP-4612=	Cisco DWDM SFP 1546.12 nm SFP (100 GHz ITU grid)
DWDM-SFP-4453=	Cisco DWDM SFP 1544.53 nm SFP (100 GHz ITU grid)
DWDM-SFP-4373=	Cisco DWDM SFP 1543.73 nm SFP (100 GHz ITU grid)
DWDM-SFP-4294=	Cisco DWDM SFP 1542.94 nm SFP (100 GHz ITU grid)
DWDM-SFP-4214=	Cisco DWDM SFP 1542.14 nm SFP (100 GHz ITU grid)
DWDM-SFP-4056=	Cisco DWDM SFP 1540.56 nm SFP (100 GHz ITU grid)
DWDM-SFP-3977=	Cisco DWDM SFP 1539.77 nm SFP (100 GHz ITU grid)
DWDM-SFP-3898=	Cisco DWDM SFP 1538.98 nm SFP (100 GHz ITU grid)
DWDM-SFP-3819=	vDWDM SFP 1538.19 nm SFP (100 GHz ITU grid)
DWDM-SFP-3661=	Cisco DWDM SFP 1536.61 nm SFP (100 GHz ITU grid)
DWDM-SFP-3582=	Cisco DWDM SFP 1535.82 nm SFP (100 GHz ITU grid)
DWDM-SFP-3504=	Cisco DWDM SFP 1535.04 nm SFP (100 GHz ITU grid)
DWDM-SFP-3425=	Cisco DWDM SFP 1534.25 nm SFP (100 GHz ITU grid)
DWDM-SFP-3268=	Cisco DWDM SFP 1532.68 nm SFP (100 GHz ITU grid)
DWDM-SFP-3190=	Cisco 1000BASE-DWDM 1531.90 nm SFP (100 GHz ITU grid)
DWDM-SFP-3112=	Cisco 1000BASE-DWDM 1531.12 nm SFP (100 GHz ITU grid)
DWDM-SFP-3033=	Cisco DWDM SFP 1530.33 nm SFP (100 GHz ITU grid)
CSS5-CABLX-LCSC=	Cisco CSS 11500 Series Content Services Switch, 10m single-mode fiber, LX LC-to-SC connectors
CSS5-CABSX-LC=	Cisco CSS 11500 10m multimode fiber, SX LC connectors
CSS5-CABSX-LCSC=	Cisco CSS 11500 10m multimode fiber, SX LC-to-SC connectors
CAB-SFP-50CM=	Cisco Catalyst 3560 SFP Interconnect Cable (50 cm)
CAB-SM-LCSC-1M	1m single-mode fiber, LC-to-SC connectors
CAB-SM-LCSC-5M	5m single-mode fiber, LC-to-SC connectors
CAB-MCP-LC=	Mode-conditioning patch cable; LC connector

Service and Support

Cisco offers a wide range of services programs to accelerate customer success. These innovative services programs are delivered through a unique combination of people, processes, tools, and partners, resulting in high levels of customer satisfaction. Cisco Services help you protect your network investment, optimize network operations, and prepare your network for new applications

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.

to extend network intelligence and the power of your business. For more information about Cisco Services, refer to Cisco Technical Support Services or Cisco Advanced Services.

Cisco is committed to minimizing TCO. Cisco offers a portfolio of technical support services to help ensure that Cisco products operate efficiently, remain highly available, and benefit from the most up-to-date system software. The services and support programs described in Table 8 are available as part of the Cisco Metro Ethernet Switching Service and Support solution and are available directly from Cisco and through resellers.

Table 8. Service and Support

Service and Support	Features	Benefits
Advanced Services		
Cisco Total Implementation Solutions (TIS), available directly from Cisco **Cisco Packaged TIS, available through resellers**	• Project management • Site survey, configuration, and deployment • Installation, text, and cutover • Training • Major moves, adds, and changes • Design review and product staging	• Supplement existing staff • Help ensure functions meet needs • Mitigate risk
Cisco SP Base Support and Service Provider-Based Onsite Support, available directly from Cisco **Cisco Packaged Service Provider-Based Support, available through resellers**	• 24-hour access to software updates • Web access to technical repositories • Telephone support through the Cisco Technical Assistance Center (TAC) • Advance replacement of hardware parts	• Facilitate proactive or expedited problem resolution • Lower TCO by taking advantage of Cisco expertise and knowledge • Minimize network downtime

Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV
Amsterdam, The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at www.cisco.com/go/offices.

CCDE, CCVP, Cisco Eos, Cisco StadiumVision, the Cisco logo, DCE, and Welcome to the Human Network are trademarks.; Changing the Way We Work, Live, Play, and Learn is a service mark; and Access Registrar, Aironet, AsyncOS, Bringing the Meeting To You, Catalyst, CCDA, CCDP, CCIE, CCIP, CCNA, CCNP, CCSP, Cisco, the Cisco Certified Internetwork Expert logo, Cisco IOS, Cisco Press, Cisco Systems, Cisco Systems Capital, the Cisco Systems logo, Cisco Unity, Collaboration Without Limitation, Enterprise/Solver, EtherChannel, EtherFast, EtherSwitch, Event Center, Fast Step, Follow Me Browsing, FormShare, GigaDrive, HomeLink, Internet Quotient, IOS, iPhone, IP/TV, iQ Expertise, the iQ logo, iQ Net Readiness Scorecard, iQuick Study, IronPort, the IronPort logo, LightStream, Linksys, MediaTone, MeetingPlace, MGX, Networkers, Networking Academy, Network Registrar, PCNow, PIX, PowerPanels, ProConnect, ScriptShare, SenderBase, SMARTnet, Spectrum Expert, StackWise, The Fastest Way to Increase Your Internet Quotient, TransPath, WebEx, and the WebEx logo are registered trademarks of Cisco Systems, Inc. and/or its affiliates in the United States and certain other countries.

All other trademarks mentioned in this document or Website are the property of their respective owners. The use of the word partner does not imply a partnership relationship between Cisco and any other company. (0801R)

Printed in USA C78-432899-01 03/08

© 2008 Cisco Systems, Inc. All rights reserved. This document is Cisco Public Information.